POLARIZATION RECONFIGURABLE ANTENNA FOR COGNITIVE RADIO: A LITERATURE SURVEY

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Abstract

The study of reconfigurable antennas has been made great progress in the recent years. Compared with conventional antennas, reconfigurable antennas have lots of advantages and applications. There configurable antenna scan provide diversity feature of operating resonant frequency, polarization, and radiation pattern. They are lighter in weight, smaller in dimension and lower in price. The latest researches of their configurable antenna are analyzed and summarized in this paper to present the characteristics and classifications.

Key words : reconfigurable antenna, antenna designs, diversity, wireless communication system

1. INTRODUCTION

With the rapid development in communication, reconfigurable antennas s is gaining more interest in area of research. The concept of reconfigurable antenna firstly appeared in D. Schaubert's patent "Frequency-Agile, Polarization Diverse Microstrip Antenna and Frequency Scanned Arrays" in1983[1].Different characteristics such as resonant frequency, radiation patterns, polarization, etc. of these antennas can be reconfigurable through the change of the structures, its parameters, dielectric material.

As a result of the significance of reconfigurable antennas, in

This paper, the latest researches are analyzed and summarized to present the functions and the implementations of reconfigurable antennas in section II and section III

2. THE FUNCTIONS OF RECONFIGURABLE ANTENNA

A. ***Frequency Reconfigurable Antenna***

Frequency reconfigurable antenna has the reconfiguration of the resonant frequency by the change of the structure, while the radiation patterns and polarization remain unchanged. So, frequency reconfigurable antenna can be applied among a very wide arrangement of frequency band or among multiple frequency bands.

B. ***Radiation Patterns Reconfigurable Antenna***

Radiation pattern reconfigurable antenna has the reconfiguration of the radiation patterns by the change of the structure, while the resonant frequency and polarization remain unchanged.

C. ***Polarization Reconfigurable Antenna:***

The polarization of each antenna in a system should be properly aligned so that maximum signal strength between stations occurs when both stations are using identical polarization. Vertical and horizontal are the simplest forms of antenna polarization and both are known as linear polarization. Circular polarization is

another form which can be used in areas such as satellite applications. Another form of polarization is elliptical polarization. It occurs when there is a mix of linear and circular polarization.

D. ***The Multiple Reconfigurable Parameters of the Antenna:***

The most remarkable feature of the antenna is that two or more parameters of the antenna can be reconfigurable. These parameters include resonant frequency, radiation patterns, and polarization and soon. This feature is very useful to achieve diversity and can be used simultaneously in multiple applications.

3. THE IMPLEMENTATION OF RECONFIGURABLE ANTENNA

The author Qing-qing Chen etc.al has reported A Polarization- Reconfigurable High Gain micro strip antenna in which a ring metal patch is cut out by two sectors which are symmetrical sectors along the origin. An air layer of 5mm (H1) is loaded between the ring patch and the ground plane. The angle of fan-shaped slots (θ3) can be adjusted to achieve good polarization- reconfigurable characteristics for the reported antenna. The antenna is excited by coaxial feed, and R5 and θ2 illustrate the feed point position. Fig. 1 shows the reported polarized reconfigurable antenna

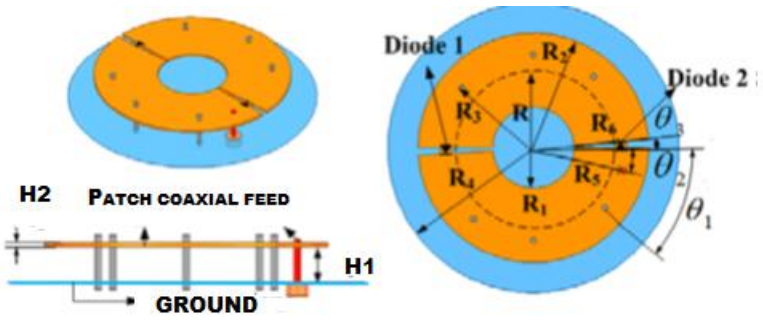

Fig 1: Design of Polarization Reconfigurable antenna

To radiate linearly polarized waves, both diodes on the ring patch should be biased in "on-state" (State 1). When both diodes are in the "on-state", they act as electrically short circuits. Therefore, the conventional ring patch micro strip antenna is achieved to radiate linear polarization

The current distribution of linear polarization of the reported antenna is very similar to the conventional ring antenna without using any slots. To radiate circularly polarized waves, one of the diode on the ring patch should be in the "ON-state" while the other should be in the "OFF-state". When diode 1 is in the "ON-state" (short circuit case) and diode 2 is in the "OFF-state". This configuration is referred to as State 2. The fan-shaped slot perturbs the surface current of the ring patch; two equal-amplitude radiation modes are excited. At the same time, the input reactance of one mode is inductive while of the other mode is capacitive. Therefore, when two near degenerate orthogonal modes of the ring patch antenna are excited with the same amplitude and a 90° phase shift on the ring patch at a given frequency, circular polarization is achieved.

Biswajit Dwivedy et.al reported A Versatile Triangular Patch Array for Wideband Frequency Alteration with Concurrent Circular Polarization and Pattern Reconfigurability antenna in which an annular shaped slot is etched out from the main triangular patch. A pair of varactor diode is inserted in this slot, which can be used for manipulation of antenna current distribution by varying its capacitance value. The position and width of the annular slot are taken in such a way that there will be no change in antenna fundamental mode of radiation at different tunable frequencies.

The cathode of the varactor diodes are connected to the lower part of the triangular patch while the anodes are connected to the upper part. A metallic pad and a shorting pin are connected to the lower and upper side of the triangular patch via high frequency inductors. The varactor diodes are reverse biased by connecting the positive terminal of the DC supply to the metallic pad and negative polarity to the ground plane. The shorting/via pin and the metallic pad have no impact on the antenna performance since they are isolated by high frequency inductors which block the RF current flow to the DC circuit.

4. CONCLUSIONS

Reconfigurable antennas have been discussed around since the 1930s. Initially, they were based on mechanical movement of a feed or other antenna part. Antenna arrays took reconfigurability to a new level with the electronic control of the antenna's pattern. Semiconductor and MEMS switches have been at the heart of most reconfigurable-antenna research since the late1990s. The need for a single antenna to perform multiple missions will continue the drive for antennas that can reconfigure themselves based upon the current need. The characteristics and classifications of reconfigurable antenna have been discussed in this paper. As a new concept of antenna, reconfigurable antenna enjoys great value and good prospects.

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